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A WEST AMERICAN JOURNAL OF BOTANY

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CERTAIN PLANT SPECIES OF THE CANYON OF HURRICANE CREEK, WALLOWA COUNTY, OREGON

Morton E. Peck

From the geologist's standpoint the Wallowa Mountains present the most interesting and diversified section of Oregon. Floristically they are no less noteworthy. The boundaries of the Wallowa mountain area are rather vague. In the broader sense the area embraces all of Wallowa County except the northwest corner, a considerable portion of eastern Union County and a strip of northern Baker County. Between six and seven hundred square miles of this territory, including what are commonly known as the high Wallowas, and the territory eastward to the Snake River, are of exceptional botanical interest. For the most part this is an extremely rugged region with deep, narrow canyons, precipitous slopes, numerous small lakes, and high peaks reaching an altitude of 10,000 feet.

The geological history of the Wallowa Mountains is extremely complex, but scarcely concerns us in the present connection. There are large exposures of Permian metamorphosed lavas, Upper Triassic crystalline limestone, great areas of quartz diorite (Cretaceous) and equally large areas of Tertiary Columbia River basalt mantling the slopes or even covering the summits of many of the high peaks. The floors and lower slopes of many deep canyons and small valleys are covered with Quaternary morainic material, mostly water-worn gravel and small boulders mixed with alluvial deposits.

As to their origin, the Wallowas form an outlying island of the Rocky Mountain system, and they present a larger exposure of Paleozoic and early Mesozoic formation at higher altitudes than occurs elsewhere in the state. These two circumstances determine to a great extent the character of the flora. The number of recorded species of Oregon plants found only in the Wallowas is very large. While not a few of these are endemics, most of them show a close relationship with Rocky Mountain species. In many cases the difference is subspecific, the distinction often being very slight.

While the actual distance of the high Wallowas from the Rocky Mountains is not great, their separation from the latter, at least as far as the distribution of alpine species is concerned, is very effectual. The extremely deep gorge of the Snake River, with no high peaks on the Oregon side for nearly 20 miles, must constitute a complete barrier to all high altitude forms except under unusual conditions. Added to the relatively rare accident

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of seed transportation across the intervening depression, the uncertainty of deposition on favorable soil with other suitable environmental conditions in so extensively barren a terraine make the chances of successful establishment of a species in the new territory very slight. The degree to which the migrant forms differ from the probable parent stock may thus be taken, in general, as an indication of the relative remoteness of the date of their first arrival. Of these differences, as stated above, we find varying degrees. At least some of these conclusions are well illustrated by a rather detailed examination of the vegetation of a very small but exceptionally favorable section of Wallowa Mountain territory recently made by the writer.

The period from July 21 to 25, 1944, was spent in collecting and studying the plants growing on a two-mile segment of the canyon of Hurricane Creek, Wallowa County, beginning at a point about 4.5 miles south of Enterprise, just above the place where the stream emerges from the narrow, steep and rugged portion of the canyon. The altitudinal range of the two-mile stretch is from a little over 6000 feet to a little under 7000.

The total length of Hurricane Creek is scarcely over 25 miles. Its general direction of flow is northward. The lower third of its course is through rather open, moderately sloping country. Above this the descent is very steep and the canyon walls are high, rugged, and often precipitous. It is fed by melting snow on some of the highest peaks of the Wallowas, especially Sackajawea and Matterhorn, both of which reach an altitude of about 10,000 feet. It bears a remarkably large volume of water for so short a stream, and the temperature is very low, even in midsummer. So steep is its bed that nearly half its course in the section studied consists of a series of noisy cataracts. Within these two miles it receives two small tributaries from the west and one, a little larger, from the east. The canyon floor in its broadest place is not much over 100 yards wide, from which it varies to only the width of the stream, so that in some places it is impossible to find footing on the margin.

The eastern slope of the canyon is very steep and consists in part of metamorphosed lava. On the west side the slope is broken, some distance up, by a more or less continuous bench, in places nearly a half-mile wide. The formation here is partly shale and conglomerate. Much the greater part, perhaps three-fourths, of the whole drainage area of the stream consists of metamorphosed limestone.

The canyon floor is made up of glacial deposits—the usual coarse sand, water-worn gravel and small boulders, with a mixture of silt in varying proportions, but often scant. At several points along the margins of the stream are sand and gravel bars, usually only a few yards in width, but in one or two cases up to a hundred yards or more in length. In one place where the canyon floor is unusually broad there is a peat bog (not sphagnum) covering perhaps an acre. Here there is abundant silt and over much of it has accumulated a rather deep layer of spongy peat. The bog seems to have been built up to its present state largely through the work of beaver.

With the set of conditions thus briefly indicated it is not difficult to understand why the flora of the canyon of Hurricane Creek presents features of uncommon interest. There is first, the great depth and narrowness of the gorge; second, the remarkable development of sand bars and peat bog, unusual in a stream bed of this character; third, the very low temperature of the water, varying little through the growing season; finally, and most significant of all, is the fact that the mountain masses from which the stream descends are largely calcareous. Such a combination of conditions can scarcely be duplicated elsewhere in the state. Add to this the comparative isolation with respect to the Rocky Mountains, where similar situations are probably not unusual, and we might well expect to find an interesting assemblage of species.

Many of the forms named in the following list are ordinarily found at much higher elevations than our records show. As so often happens in deep narrow canyons carrying streams from melting snow, alpine species have descended to a much lower level than that to which they are accustomed, the icy water probably favoring the downward extension of their range. To what extent the calcareous content of the water may have influenced the plant population as a whole may be judged by the list following. Included in this are only those species that for one reason or another appear to be of particular interest. Most of these are from the canyon floor or moist banks just above it, though some are from higher slopes. Many others might, perhaps, have been appropriately included.

Botrychium virginianum (L.) Sw. Several specimens were found on moist banks above the stream. The species is rare in Oregon.

Equisetum variegatum Schleich. Some of the bars along the creek are covered with a dense mat of this species. Otherwise it seems rare and local in the state.

Pinus flexilis James. One of the rarest of Oregon conifers. There is a small colony on the high eastern slope of the canyon of Lostine River, Wallowa County, about twenty miles above the mouth. This second colony was found on the western slope of Hurricane Creek canyon. None of the trees in either case are very large. In both localities they grow in dry calcareous soil.

Poa alpina L. Noted in several places on wet banks and bars far below its usual altitudinal range.

Glyceria Otisii Hitchc. A few small colonies were found in the peat bog. Apparently this is a very local species not hitherto reported from Oregon.

Calamagrostis neglecta (Ehrh.) Gaertn. Found sparingly on wet banks.

Muhlenbergia andina (Nutt.) Hitchc. A single colony was discovered on a wet bank. The species is rarely met with in Oregon.

Kobresia simpliciuscula (Wahl.) Mack. A single large clump was discovered on a moist bank. The species occurs from Alaska to Greenland and southward in the Rocky Mountains to Colorado, also in Eurasia, but it has not been reported previously from Oregon. It is always found, apparently, in calcareous soil.

Carex disperma Dew. Plentiful in the peat bog. The species is widely distributed in the state at moderately high altitudes, but is nowhere very common.

Carex gynocrates Wormsk. Grows in considerable abundance in the peat bog. Its normal range is far northward and eastward. It is known from British Columbia and Colorado, but hitherto not very near to Oregon. Calcareous soil seems to be one of its requirements.

Carex leptalea Wahl. Plentiful in the peat bog. A widely distributed species but rare in Oregon except in bogs along the coast.

Carex pseudoscirpoidea Rydb. Infrequent on wet banks. Mainly a Rocky Mountain species, reaching eastern Washington and Oregon. It has previously been collected in the Steens Mountains and at least once in the Wallowas.

Carex concinna R. Br. Rather plentiful in several places on slightly moist banks well above the water. This is another species confined to calcareous soil. It occurs in the Rocky Mountains and eastward, the present collection being a great extension of the known range.

Carex capillaris L. Plentiful on wet banks above the stream. Our material is perhaps var. *elongata* Oln. Both the species and the variety are known from British Columbia, the Rocky Mountains, and far eastward, but not hitherto from Oregon.

Carex Vahlii Schk. Only two small stands were found, both on banks well above the water. It is a widely distributed species on calcareous soil, occurring from Yukon to Greenland and in the Rocky Mountains south to Idaho and Utah, also it has an extensive distribution in the Old World. Apparently it has not been found before in Oregon.

Juncus Regelii Buch. A small form occurs sparingly on bars along the stream.

Sisyrinchium idahoense Bickn. A low slender form with pale flowers and stems scarcely at all clustered was found in some abundance on wet gravel bars. It might prove to be a well-marked variety.

HABENARIA OBTUSATA (Banks.) Rich. A good-sized colony was discovered on a shaded, mossy bank some distance above the stream. The distribution, as hitherto known, extends from the Aleutian Islands to New Brunswick and southward in the Rocky Mountains to Idaho and Colorado. Ours seems to be the first record for Oregon.

CORALLORRHIZA TRIFIDA Chat. A few small plants were found on the low western slope of the canyon. Of wide distribution northward and eastward, in the far west this species seems not to have been previously recorded south of southern Washington.

SALIX WOLFII Bebb var. IDAHOENSIS Ball. Found sparingly on wet banks. The distribution is mainly Rocky Mountain, but the species has been previously reported from Wallowa County.

SALIX BRACHYCARPA Nutt. var. SANSONI Ball. Occurs sparingly on wet banks and margins of the peat bog, growing close to the water. The species occurs in the Rocky Mountains and far northward. The variety was taken by the writer some years ago in Walowa County on the margin of Ice Lake at the southern base of Matterhorn.

SALIX VESTITA Pursh. A single specimen was found on a wet bank. The species has been previously taken in the Wallowa Mountains but is rare. It ranges northward to British Columbia and eastward to Newfoundland.

BETULA GLANDULOSA Michx. A few specimens were noted on low banks close to the stream. They were unusually large, attaining a height of 2 to 3 meters.

ERIOGONUM KINGII T. & G. A few plants were found high on the western slope of the canyon. This species has been collected once previously by the writer in the Wallowa Mountains near Aneroid Lake.

POLYGONUM VIVIPARUM L. Plentiful on wet banks and bars. This is below its usual range.

ARENARIA PROPINQUA Rich. Plentiful on bars along the creek.

ARENARIA ROSSII Rich. A single specimen was collected on a wet bank. We have no other dependable record of its occurrence in Oregon. It is an arctic and arctic-alpine species of Alaska and occurs southward in the Rocky Mountains to Colorado; it is also reported from Washington.

SILENE ACAULIS L. var. SUBACAULESCENS Fern. & St. John. Plentiful on sand bars, often forming large mats, a few of them flowering profusely but the greater number only sparingly. The species is rare in the Wallowa Mountains and unknown elsewhere in Oregon.

THALICTRUM ALPINUM L. Three or four good-sized colonies were found in damp ground near the stream. So far as we know this is the first recorded occurrence of the plant in Oregon.

ANEMOME PARVIFLORA Michx. Rather plentiful in moist places near the creek. A species occurring in calcareous soil, its main range is in the Rocky Mountains and far northward and eastward, the Wallowa Mountains being an isolated area, where we know of but two or three previous records.

ANEMONE GLOBOSA Nutt. Very abundant on dry grassy benches well above the stream; elsewhere in the Wallowa Mountains it occurs more sparingly and it is known from no other section of the state.

AQUILEGIA FORMOSA Fisch. var. FLAVESCENS (Wats.) Frye & Rigg. Very plentiful on the benches along the west slope of the canyon. Neither typical *A. formosa* nor even an intergrade with the yellow-flowered variety were seen. Elsewhere in the Wallowa Mountains all intermediates between the two may be found.

DRABA PRAEALTA Greene. Quite plentiful in open woods on dry slopes.

DRABA NIVALIS Lilj. var. ELONGATA Wats. Several specimens were found on sand bars.

LESQUERELLA SHERWOODII Peck. Occurs sparingly on dry stony banks.

ARABIS HIRSUTA Scop. var. PYCNOCARPA (Hopk.) Roll. Apparently rare. Two or three specimens were found on damp ground near the creek. The variety is well marked by the rather crowded cauline leaves, small flowers, strictly erect fruit, and spreading, mostly simple trichomes of the stem.

SAXIFRAGA OPPOSITIFOLIA L. A single specimen, not flowering, was found on a damp bar.

DRYAS DRUMMONDII Rich. Plentiful on damp sand bars, forming large dense mats, often 1.5 m. across, and flowering abundantly. In the Wallowa Mountains this species, as well as *D. octopetala,* are found mainly, if not altogether, on calcareous soil.

ASTRAGALUS IMPENSUS (Sheld.) Woot. & Standl. Several plants were noted on dry banks near the creek.

ASTRAGALUS PURSHII Dougl. On dry benches; not common.

ASTRAGALUS ALPINUS L. Quite plentiful on gravel bars. This matches very closely material from alpine summits of the Wallowas. Two other related forms occur less frequently. One of these is very dwarf, the stem only 2 to 3 cm. long, the leaves 4 to 6 cm. with fifteen to twenty-five leaflets 6 mm. long or less, pilose beneath, the flowers very few and small, about 8 mm. long, the calyx white-pilose and pods much longer than in the usual form, white-pilose or with some blackish hairs intermixed. The other plant has stems up to 2 dm. long, leaves 5 to 6 cm., with the thirteen to fifteen leaflets 8 to 10 mm. long and sparsely strigose beneath. The flowers are 10 mm. long, with black-hairy calyx, and the pods small and strongly black-hairy as in typical *A. alpinus.* "Hurricane Creek" is given as the type locality of *Atelophragma alpiniformis* Rydb. We suspect that the second of these two forms is very close to Rydberg's type; it differs, however, in the larger flowers and somewhat pubescent, instead of glabrous, leaflets. The dwarf form might easily be regarded as specifically distinct. *Astragalus alpinus,* however, is a highly variable, often puzzling species, and one might hesitate about making further segregation.

OXYTROPIS VISCIDA Nutt. Plentiful, mostly on dry gravelly banks. Our material is placed here with some uncertainty. The characters relied on to separate *Aragallus viscidula* Rydb. from *Oxytropis viscida* are not very satisfactory. Our specimens have the smaller number of leaflets, mostly twenty-one to thirty-one, of the former, as well as the rather gradually acuminate pods and the more or less black-hairy calyx. The hairiness at the base of the plant is variable. The flowers, on the other hand, in all specimens seen, are whitish as is sometimes the case in *O. viscida;* according to the description of *Aragallus viscidula,* its flowers are not whitish.

OXYTROPIS CUSICKII Greenm. A few specimens were found on gravel bars.

HEDYSARUM BOREALE Nutt. On dry, rocky banks; not common.

PYROLA MINOR L. On wooded slopes. Infrequent.

PYROLA CHLORANTHA Sw. Found sparingly on shaded slopes.

DODECATHEON ALPINUM (Gray) Greene. A single plant was found on a wet bank near the stream. This is apparently out of the usual range of the species.

GENTIANA INTERRUPTA Greene. Plentiful in one locality on an old gravel bar. This species has been previously reported from Oregon, but we have seen no definite locality assigned. It is mainly a Rocky Mountain species, but is known from Washington.

SWERTIA PERENNIS L. Abundant specimens were found on a moist slope above the stream in one restricted area which is probably the exact locality where Cusick collected the type of *S. occidentalis* Greene. An examination of our material verifies St. John's statement (Revision of the Genus Swertia, Am. Midl. Nat. 26: 9–10. 1941) that the type and isotypes of Greene's species have some plants with 4-merous and some with 5-merous flowers. In our material we find both forms, in some cases even on the same plant.

CRYPTANTHA CELOSIOIDES (Eastw.) Pays. A few specimens were found on the high dry western slope of the canyon.

PENSTEMON WILCOXII Rydb. The most abundant species of the genus. It occurs in open woods, thickets and meadows.

VERONICA CUSICKII Gray. This occurs sparingly on grassy slopes well above the stream.

CASTILLEJA WALLOWENSIS Penn. An apparently rare and distinct species. Two examples were collected on bars along the creek.

PINGUICULA VULGARIS L. Found sparingly on wet shady banks near the creek.

SOLIDAGO CILIOSA Greene. Plentiful in places on moist banks.

Many of the plants are large and the heads have unusually long rays.

Antennaria pulvinata Greene subsp. **albescens** E. Nels. Only a few specimens were found on some of the higher bars along the creek. This is a Rocky Mountain plant, the variety being known previously from Idaho but hitherto not from Oregon. It is easily recognizable by the strongly spreading, light brown involucral bracts as well as by the densely pulvinate habit, and the very small, rhombic-spatulate leaves.

Willamette University,
Salem, Oregon.

GENERIC NAMES OF ALGAE PROPOSED FOR CONSERVATION. I

George F. Papenfuss

In the course of work on South African and other marine algae, it has been found that several old and well-established generic names are invalid. They are hereby proposed for conservation.

Chlorophycophyta

Cladophora Kützing (Cladophoraceae), Phyc. general. 262. 1843.
versus
Annulina Link, *in* Nees von Esenbeck, Horae phys. berol. 4. 1820.

Type species: *Cladophora glomerata* (L.) Kütz.

Annulina Link (1820) is based upon seven species of which four, *Conferva glomerata, C. albida, C. nigricans,* and *C. rupestris,* and possibly a fifth, *C. rivularis,* are representative of *Cladophora* Kützing (1843). Of the two remaining entities, *Conferva sordida* is a species of *Conferva* Linnaeus (1753) and *C. compacta* is a species of *Urospora* Areschoug (1866), which name has been conserved.

Since *Cladophora* has been an accepted genus for more than a century, its conservation would probably be welcomed by most phycologists.

A name usually regarded as, in part, synonymous with *Cladophora* is *Chantransia* DeCandolle. This is owing to the belief that *Chantransia* was described for the first time by DeCandolle in the third edition of DeLamarck and DeCandolle's *Flore Française* (1805, vol. 2, p. 49); and as there conceived the genus included representatives of the green algal genera *Cladophora* and *Oedogonium* and the red algal genera *Batrachospermum* and *Lemanea.* In a recent paper it was pointed out by Papenfuss (1945) that *Chantransia* could not properly replace either *Lemanea* or *Batrachospermum.* Of the two remaining genera, *Oedogonium* has already been conserved; and *Cladophora* is thus left as the only genus possibly requiring conservation against *Chantransia.*

Careful study of the text of DeCandolle has revealed that under *Chantransia vesicata* he had listed among other synonyms "*Chantransia nodosa* Decand. Bull. n. 51. p. 21." This clue led to the discovery that DeCandolle had actually described *Chantransia* four years previously in the third volume of the *Bulletin des Sciences de la Société Philomatique* (1801). In this publication, DeCandolle had referred only two species, *Conferva nodosa* Vauch. and *Chantransia nigricans* Decand., to his new genus. It has not been possible to ascertain the subsequent fate of *Chantransia nigricans*, but since DeCandolle excluded it from his genus as extended in the *Flore Française* (1805), it may be supposed that he regarded it as belonging elsewhere. This would leave *Chantransia nodosa* (= *Conferva nodosa* Vauch.) as the type of *Chantransia;* and inasmuch as this entity is a species of *Oedogonium,* viz., *O. vesicatum* (Vauch.) Wittr., *Chantransia* becomes synonymous with *Oedogonium,* which is a *nomen conservandum.*

PHAEOPHYCOPHYTA

ZONARIA Agardh (Dictyotaceae), Syn. alg. scand. p. xx. 1817.
versus
Zonaria Roussel, Fl. Calvados 99. 1806.

Type species: *Zonaria Tournefortii* (Lamour.) Mont.

As a genus of algae, *Zonaria* was apparently first described by Agardh in 1817 in his *Synopsis algarum scandinaviae.* From this and certain other early works, the impression is gained that the name was originally given by Draparnaud. Usually, the place of publication was not cited, but occasionally reference was made, sometimes with a query, to Draparnaud's (1801) *Discours sur les moeurs et la manière de vivre des plantes.* However, search through this and other works of Draparnaud has failed to reveal the epithet; and it seems safe to conclude that *Zonaria* was a manuscript name of Draparnaud which he had never published. Further support for this assumption is furnished by the fact that the binomials under *Zonaria* that are attributed to Draparnaud are usually cited as "ined." or "mscr." or with a query, while at least two of them, *Z. Pavonia* and *Z. squamaria,* are referred to by DeCandolle (*in* DeLamarck et DeCandolle, 1805, p. 17) as occurring in "Herb. Jussieu."

As a generic epithet, the name *Zonaria* seems to have been first published by Roussel (1806, p. 99). He applied it to a group of fungi, typified by "*Auricularia tremelloides* B." *Zonaria* Roussel has, however, not been taken up by mycologists, whereas *Zonaria* Agardh has for a long time received recognition among phycologists.

The conservation of *Zonaria* Ag. would automatically reduce *Villania,* which name was proposed by Nieuwland (1917) as a substitute for *Zonaria* Ag. Nieuwland's arguments for the rejection of *Zonaria* have been severely criticized by Setchell and Gardner (1925).

Recently, Tandy (1935) proposed *Zonaria* for conservation against *Villania.* As lectotype, he suggested *Z. variegata* (Lamour.) Ag. But J. Agardh had already, in 1894, made this species the basis of his genus *Gymnosorus.* The entity is now known as *Pocockiella variegata* (Lamour.) Papenfuss (1943).

In this connection, attention may also be drawn to *Chordaria divaricata,* which species Tandy (*loc. cit.*) has designated as the type of the genus *Chordaria* Ag. This species had previously been removed from *Chordaria* by both Kützing (1843) and J. Agardh (1880); and more recently Kylin (1940) made it the type of his new genus *Sphaerotrichia. Chordaria flagelliformis,* which Kylin (*op. cit.*) has selected as the type of *Chordaria,* would be a more appropriate choice for this purpose.

Rhodophycophyta

As is apparent from a casual glance at the synonymy of certain species of *Lomentaria* Lyngbye (1819), *Chylocladia* Greville (*in* Hooker, 1833) and *Gastroclonium* Kützing (1843), there has existed in the past much confusion as to the exact limits of these genera, and transfers from one to the other have repeatedly been made. In addition, several other genera, such as *Champia, Laurencia,* and *Chondria,* have at times also been drawn into the confusion. This situation was not remedied until the appearance of Kylin's monograph of the Rhodymeniales. As delimited by Kylin (1931), these genera are comparatively easily separated.

If, however, the synonymy of *Lomentaria, Chylocladia,* and *Gastroclonium* is checked, it is found that these names are invalidated by epithets given by Stackhouse (1809) in his ill-fated "Tentamen marino-cryptogamicum," which was published in the second volume of the *Mémoires de la Société Impériale des naturalistes de Moscou.* As is known, this paper of Stackhouse embodies one of the earliest attempts towards a division of the Linnean genera, *Fucus, Ulva,* and *Conferva,* into a greater number of genera. But the work was overlooked for a long time with the result that most of Stackhouse's genera were never taken up.

In 1891, Kuntze revived a large number of generic names which had been forgotten, including several of those of Stackhouse (in some instances with slight modification of spelling). This restoration of old names by Kuntze was the prime factor responsible for the passage of rules governing the conservation of generic names by the International Botanical Congress.

In the list of *Nomina Generica Conservanda,* in the third (1935) edition of the "International Rules of Botanical Nomenclature," is included, among others, a number of names of algal genera which have been conserved against names given by Stackhouse. Of the three genera mentioned above, viz., *Lomentaria, Chylocladia,* and *Gastroclonium,* only *Chylocladia* has been conserved, even though, as has been said, names given by Stackhouse invalidate all three.

Lomentaria Lyngb. has been typified by both Schmitz (1889) and Kylin (1931) with *L. articulata* (Huds.) Lyngb. and both these authors have also designated *Chylocladia kaliformis* (Good. and Woodw.) Grev. as the type of *Chylocladia* Grev. This species should, however, be known as:

Chylocladia verticillata (Lightf.) Papenfuss, comb. nov. (= *Fucus verticillatus* Lightfoot, Fl. scot. 2: 962, pl. 31. 1777. *Fucus kaliformis* Goodenough and Woodward, Trans. Linn. Soc. 3: 106, 206, pl. 18. 1797).

As the type of *Gastroclonium* Kütz., Kylin (1931) has chosen *G. ovale* (Huds.) Kütz., which species is now known as *G. ovatum* (Huds.) Papenfuss (1944).

Although the conservation of *Chylocladia* Grev. is highly desirable, in view of its invalidation by both *Kaliformis* Stackhouse (1809, as represented by *K. verticillatus*) and *Kaliformia* Stackhouse (1816, as represented by *K. verticillata* and *K. diaphana*), it is unfortunate that the name was conserved against *Sedoidea* Stackhouse (1809). This genus of Stackhouse is based on two entities, *S. purpurea* and *S. olivacea*; both of which are synonymous with *Gastroclonium ovatum;* and, as pointed out above, this species was designated as the type of *Gastroclonium* by Kylin in 1931. In its conservation of *Chylocladia* against *Sedoidea,* the committee on conservation was guided no doubt by the belief of Kuntze (1891) that these names were synonymous.

In addition to *Gastroclonium* and *Lomentaria,* the following genera of red algae have been found to require conservation: *Helminthora* J. Ag., *Laurencia* Lamour., *Catenella* Grev., *Gelidium* Lamour., *Pterocladia* J. Ag., *Chondria* Ag., *Plumaria* Schmitz, *Dasyphila* Sonder, and *Iridaea* Bory. All of them, with the exception of *Helminthora,* are invalidated wholly or in part by names given by Stackhouse.

HELMINTHORA J. Agardh (Helminthocladiaceae), Sp. alg. 2(2): 415. 1852.

versus

Helminthora Fries, Syst. orb. veg. 1: 341. 1825; Corp. flor. prov. suecia. I. Flor. scan. 311. 1835.

Type species: *Helminthora divaricata* (Ag.) J. Ag.

Fries in 1825 erected a genus *Helminthora* without, however, referring any particular species to it until 1835, when he assigned to it *Rivularia multifida* Weber et Mohr. This species was subsequently found to belong to *Nemalion* Duby (1830).

The later homonym of *Helminthora* J. Agardh dates from 1852, and was proposed by J. Agardh for a genus belonging to the same family as *Nemalion*. Since that time *Helminthora* J. Ag. has become well established in algological literature.

In regard to *Nemalion*, it may be remarked that this genus is usually ascribed to Targioni-Tozzetti, who presumably published it in Bertoloni (1819, p. 300). From this work of Bertoloni, it is obvious, however, that Targioni-Tozzetti had used the name only in manuscript. Bertoloni described the entity in question as *Fucus Nemalion*. The genus *Nemalion* should consequently be accredited to Duby, who formally described it in 1830 (p. 959). In certain older works, the genus is, in fact, ascribed to Duby. The type species is *N. helminthoides* (Velley) Batters (1902), which is an older name for *N. lubricum* Duby (*loc. cit.*).

GELIDIUM Lamouroux (Gelidiaceae), Essai 128. 1813.
versus
Cornea Stackhouse, Tent. mar.-crypt. 57. 1809, in part (as represented by *C. spinosa, op. cit.,* p. 83; *C. filicina, C. sericea, C. pusilla,* and *C. deformis, op. cit.,* p. 84).
Clavatula Stackhouse, Tent. mar.-crypt. 95, 97. 1809.
Kaliformia Stackhouse, Ner. brit., ed. 2, p. ix. 1816, in part (as represented by *K. pusilla, op. cit.,* pp. xii, 9, pl. 6).
Clavaria Stackhouse, Ner. brit., ed. 2, pp. x, xii, 23, pl. 12. 1816.

Type species: *Gelidium corneum* (Huds.) Lamour. (cf. Schmitz, 1889, p. 439).

PTEROCLADIA J. Agardh (Gelidiaceae), Sp. alg. 2(2): 482. 1852.
versus
Cornea Stackhouse, Tent. mar.-crypt. 57. 1809, in part (as represented by *C. capillacea, op. cit.,* p. 84).

Type species: *Pterocladia lucida* (Turn.) J. Ag.

CATENELLA Greville (Rhabdoniaceae), Alg. brit. pp. lxiii, 166, pl. 17. 1830.
versus
Kaliformis Stackhouse, Tent. mar.-crypt. 56. 1809, in part (as represented by *K. Opuntia, op. cit.,* p. 79).
Kaliformia Stackhouse, Ner. brit., ed. 2, p. ix. 1816, in part (as represented by *K. Opuntia, op. cit.,* pp. xii, 42, pl. 17).

Type species: *Catenella repens* (Lightf.) Batters (1902, p. 69), which is the valid name for *C. Opuntia* (Good. and Woodw.) Grev.

IRIDAEA [Iridea] Bory (Gigartinaceae), Dict. class. hist. nat. 9: 15. 1826; *in* Duperrey, Voy. autour du monde (Coquille), Botanique 2(1): 103. 1828.
versus
Iridea Stackhouse, Ner. brit., ed. 2, pp. ix, xii. 1816.

Mazzaella J. de Toni, Not. nomencl. alg. vii: [4]. 1936 (May).
Iridophycus Setchell and Gardner, Proc. Nat. Acad. Sci. 22: 469. 1936 (August).

Type species: *Iridaea cordata* (Turn.) Bory.

When describing his genus *Iridaea,* in 1826, Bory pointed out that he used this name because the earlier *Iridea* of Stackhouse (1816), which was synonymous with *Desmarestia* Lamouroux (1813), could not be maintained. Originally, Bory spelled the name both as *Iridea* and as *Iridaea,* but later he (Bory, 1828) and others spelled it as *Iridaea;* and it is in this form that the name has come down to the present. Technically, both versions of the name are invalid, since *Iridea* is a later homonym of the genus of Stackhouse and *Iridaea* is an orthographic variant of *Iridea.*

The validity of *Iridaea* was not questioned until 1936, when Setchell and Gardner rejected it in favor of their newly erected *Iridophycus* on the grounds that (1) it was invalidated by *Iridea* Stackhouse, (2) the species, *Fucus edulis* Stackh., with which it was first typified by Greville (1830, p. 157) was the type of *Dilsea* Stackhouse (1809), and (3) the lectotype, *Fucus cordatus* Turn., of J. Agardh (1876) seemingly had been lost and was ". . . somewhat confused as to exact identity" (Setchell and Gardner, *op. cit.,* p. 470). Later, Setchell (1940) succeeded in tracing the type specimen of *Fucus cordatus* to the herbarium of the Royal Botanic Garden of Edinburgh; and a study of it revealed that it actually was a species of *Iridaea* or *Iridophycus.*

In recent times, some writers (Taylor, 1939; Smith, 1944) have accepted *Iridophycus* while others (Kylin, 1941; Skottsberg, 1941; Baardseth, 1941; Levring, 1944) have retained *Iridaea.*

Inasmuch as *Iridaea* Bory has been an accepted genus for a long time, it seems desirable to conserve it against the earlier *Iridea* of Stackhouse. Such action would be especially advantageous in view of the fact that Kylin (1941) has found that the type and only species of *Collinsia* J. Ag., *C. californica,* was a species of *Iridaea. Collinsia* had, however, previously been renamed *Mazzaella* by J. de Toni (May, 1936), and this name antedates *Iridophycus* Setchell and Gardner (August, 1936) by several months. Unless *Iridaea* were conserved, a comparatively large number of species would thus have to be transferred to the little-known *Mazzaella.*

LOMENTARIA Lyngbye (Champiaceae), Tent. hydrophyt. dan. 101, pl. 30, fig. A. 1819.
versus
Kaliformis Stackhouse, Tent. mar.-crypt. 56. 1809, in part (as represented by *K. articulatus, op. cit.,* p. 78).
Dasyphylla Stackhouse, Ner. brit. ed. 2, p. ix. 1816, in part (as represented by *D. articulata, op. cit.,* pp. xi, 14, pl. 8).

Type species: *Lomentaria articulata* (Huds.) Lyngb.

Gastroclonium Kützing (Champiaceae), Phyc. general. 441. 1843.
versus
Sedoidea Stackhouse, Tent. mar.-crypt. 57, 83. 1809.
Dasyphylla Stackhouse, Ner. brit. ed. 2, p. ix. 1816, in part (as represented by *D. ovalis* and *D. sedoidis*, *op. cit.*, pp. xi, 25, pl. 12).

Type species: *Gastroclonium ovatum* (Huds.) Papenfuss (cf. Kylin, 1931, p. 30).

Plumaria Schmitz (Ceramiaceae), Kleinere Beitr. Kennt. Florid. vi, 5. 1896.
versus
Plumaria Stackhouse, Tent. mar.-crypt. 58, 86. 1809.

Type species: *Plumaria elegans* (Bonnem.) Schmitz (1889, p. 450).

Stackhouse, in 1809, founded a genus *Plumaria* upon two entities (at least as to synonymy), *Fucus plumosus* Hudson (1762, p. 473) and *F. pectinatus* Gunnerus (1772, p. 122), which he united under the name *Plumaria pectinata.*

Unaware of Stackhouse's genus, Agardh (1817, pp. xix, 39) established a genus *Ptilota* upon exactly the same two entities, which he united under the name *Ptilota plumosa,* and an additional variety β *Asplenioides* (= *Fucus Asplenioides* Turner = *Ptilota Asplenioides* (Turn.) Agardh).

Although both these genera are still accepted, and usually accredited to Stackhouse and Agardh, respectively, they have been the cause of much confusion.

Technically, *Ptilota* Ag. is invalid; and the species currently assigned to it should be referred to *Plumaria* Stackh., and a new generic name should be created for those species that are now placed in *Plumaria.* However, such action would probably aggravate the confusion instead of remedying it. Consequently, it seems best to retain *Ptilota* and to reject *Plumaria* Stackhouse in favor of *Plumaria* Schmitz. In 1896, Schmitz "amended" *Plumaria;* but in such a way that it had nothing but the name in common with the genus of Stackhouse. Although *Plumaria* Schmitz, like most old genera, originally contained certain species that belong elsewhere, it nonetheless includes a group of plants which is separable from *Ptilota* Ag. As now accepted, *Plumaria* is essentially the genus as it was understood by Schmitz, although the name is still accredited to Stackhouse. However, in a recent work, Kylin (1944) broke away from this long-established custom, and ascribed the genus to Schmitz.

Dasyphila O. G. Sonder (Ceramiaceae), Bot. Zeit. 3: 53. 1845.
versus
Dasyphylla Stackhouse, Ner. brit. ed. 2, pp. ix, xi. 1816.

Type species: *Dasyphila Preissii* O. G. Sonder.

CHONDRIA Agardh (Rhodomelaceae), Syn. alg. scand. p. xviii. 1817.
versus
Kaliformis Stackhouse, Tent. mar.-crypt. 56. 1809, in part (as represented by *K. dasyphyllus, op. cit.*, p. 78).
Dasyphylla Stackhouse, Ner. brit., ed. 2, p. ix. 1816, in part (as represented by *D. Woodwardii, op. cit.*, pp. xi, 64, pl. 16; and *D. tenuissima, op. cit.*, pp. xii, 51, pl. 18).
Type species: *Chondria tenuissima* (Good. et Woodw.) Ag.

LAURENCIA Lamouroux (Rhodomelaceae), Essai 130. 1813.
versus
Osmundea Stackhouse, Tent. mar.-crypt. 56, 79. 1809.
Kaliformis Stackhouse, Tent. mar.-crypt. 56. 1809, in part (as represented by *K. obtusus, op. cit.*, p. 79).
Pinnatifida Stackhouse, Ner. brit. ed. 2, pp. ix, xii. 1816.
Type species: *Laurencia obtusa* (Huds.) Lamour. (cf. Schmitz, 1889).

Department of Botany,
University of California, Berkeley.

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GERMINATION OF PHACELIA SEEDS

CLARENCE R. QUICK

In the fall of 1942 the writer made some tests on the germinative reactions of *Phacelia* seeds. This work was carried on to facilitate cyto-taxonomic studies in *Phacelia* being carried on by Dr. Marion S. Cave and Dr. Lincoln Constance of the Department of Botany, University of California, Berkeley, which have culminated in the publication of three papers on chromosome numbers in the Hydrophyllaceae (Univ. Calif. Publ. Bot. 18: 205–216. 1942; 18: 293–298. 1944; in press). The methods used were based upon previous experience in the germination of seeds of *Ribes* and *Ceanothus,* and of other plants native to California. *Ribes* seeds, which are similar to those of *Phacelia* in size, appearance, and ecologic relationships, have been studied extensively by the writer during the past fifteen years.

Quick (1935) showed that germinative reactions of *Ceanothus* species vary widely, and that variations tend to correlate with the ecologic and taxonomic affinities of species and groups of species concerned. Mirov (1936) summarized the results of a large number of germination tests on seeds of native California plants with respect to taxonomic position, altitudinal distribution, and growth form of the species concerned. In general he found no consistent relation between systematic position and germinative behavior, but he did find definite correlations between germinative behavior and altitudinal distribution. He found that failure of germination due to seed-coat dormancy was more common in plants from low altitudes, and that failure due to embryo dormancy was more often encountered in plants from high altitudes. Seeds of annuals were less generally dormant than seeds of herbaceous perennials, shrubs, and trees.

The low germination percentages for some samples of *Phacelia* seeds, as reported by Mirov (1940) and Mirov and Kraebel (1937), suggested that stratification might be necessary to satis-

Table 1.

Germination of *Phacelia* seeds in the greenhouse after stratification for periods and at temperatures indicated.
(Figures are percentages of seedlings that emerged from sand culture.)

Plant species*	Approximate altitude at which plant was collected (feet)	Germination after first stratification				Additional germination after second stratification				Additional germination after third stratification	
		Flat A No stratification (control)	Flat B 5° C., 86 days	Flat C 2.2° C., 114 days	Flat D 0° C., 142 days	Flat A 2.2° C., 112 days	Flat B 2.2° C., 112 days	Flat C 0° C., 140 days	Flat D 0° C., 154 days	Flat A 0° C., 154 days	Flat B 0° C., 147 days
P. distans Benth.	6,000	**26**†	16	8	2	2	0	4	**13**	2	6
P. vallicola Congdon	5,600	**93**	**76**	37	13	0	0	7	0	0	0
P. Quickii J. T. Howell	6,100	**85**	**44**	25	33	**3**	1	3	0	0	0
P. distans Benth.	5,000	**60**	**67**	**47**	27	7	**7**	20	0	**7**	**7**
P. Lemmonii A. Gray	3,000?	**62**	**62**	**96**	**47**	**20**	0	0	0	**1**	0
P. mutabilis Greene	6,500	0	6	**65**	**67**	54	15	**17**	2	**16**	35
P. leucophylla Torr.	8,000	2	0	**42**	**80**	38	28	**32**	0	20	**52**
P. dasyphylla Greene	11,000	0	0	**25**	0	6	0	**69**	19	44	50
P. alpina Rydb.	7,500	0	0	24	**84**	10	30	**46**	**12**	34	**52**
P. mutabilis Greene	8,500?	0	0	13	**60**	50	3	**83**	**33**	**50**	27
P. mutabilis Greene	6,500	0	6	10	**54**	**70**	21	37	**18**	**18**	**63**
P. compacta Greene	8,400	0	2	2	**58**	3	8	**75**	**18**	48	**63**
P. alpina Rydb.	11,100	0	0	14	**43**	29	43	43	0	29	**57**
P. compacta Greene	10,200	0	0	8	**44**	20	30	58	12	32	12
P. mutabilis Greene	6,300	0	4	18	**24**	22	32	36	22	42	**38**
P. leucophylla Torr.	Unknown	0	0	0	**38**	0	0	69	5	64	**31**

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* First 5 species of *Phacelia* are annuals; the last 11 are, according to Lincoln Constance, members of the *P. magellanica-californica-heterophylla* polyploid complex.

† Figures in bold face type represent the highest percentage for each collection and all germinations of 40 per cent or more following the first stratification, or of totals of 70 per cent following the second and third periods.

factory germination of many species of *Phacelia* seeds. Unpublished data of the author indicated that seeds of *Phacelia mutabilis* had dormant embryos, and suggested also that the seed coat was somewhat impermeable to water. Quick (1943) outlined several common methods of forcing germination of dormant seeds. Dormant seeds, that is, seeds not immediately germinable, often grow satisfactorily in the greenhouse if the germination period is immediately preceded by one of stratification, that is, by a period of refrigeration with an adequate supply of air, moisture, and mineral nutrients. Difficulty in plumping seeds with slightly impermeable seed coats is sometimes obviated by repeated alternate exposures at stratification and greenhouse temperatures. Another treatment which is sometimes successful with hard-coated seeds, and which may be called delayed stratification, subjects dormant seeds to greenhouse temperatures under favorable germinative conditions prior to any refrigeration treatment. This delayed stratification treatment is attained if a control culture—a culture placed in the greenhouse immediately after planting to see whether untreated seeds will germinate—is subjected to treatment in cold storage, following the exposure at the greenhouse temperature, and is then retested for germination.

Table 1 presents results of germination tests upon seeds of several species of *Phacelia* listed in the approximate order of their germinative reactions. The sequence of treatments applied to flat A may be outlined as follows: The seeds were planted in moist, washed, autoclaved river sand on October 11, 1942. The cultures were wet with a mineral nutrient solution and thereafter kept moist at all times, treated with copper oxalate to prevent damping-off, and placed immediately in the greenhouse for germination test. After 56 days in the greenhouse they were subjected to 112 days of stratification at 2.2° C. and were then returned to the greenhouse. After a second germination period of 35 days they were again placed in stratification, this time at 0° C. for 154 days. On October 5, 1943, they were placed in the greenhouse for a third germination test and after 35 days were discarded. Flats B, C, and D were given a similar sequence of treatments. The tests averaged about 50 seeds per culture.

From the author's experience with many seeds, especially with those of *Ribes,* the maximum effects from stratification can be expected from the three low temperatures of 5°, 2.2°, and 0° C., for periods of approximately 84, 112, and 140 days, respectively.

It is apparent that seeds of the four annual species of *Phacelia* were not dormant; that is, there was little or no interference to immediate greenhouse germination. Seeds of these species were usually collected at lower altitudes than the perennial species. Seeds of many of the perennial species were best conditioned for germination by stratification at 0° C. In germination tests following the first refrigeration treatment, one sample showed germination only after stratification at 0°. Several species failed to germinate after stratification at 5°. Stratification at 0° may obviate seed-coat dormancy more effectively than stratification at slightly higher temperatures because of the probable alternation of temperatures above and below the freezing point of water. In any event, stratification at 0° was generally much more satisfactory for conditioning seed of the perennial species for germination. This result suggests that some of the special treatments for making hard seeds permeable to water might be used to advantage on a number of *Phacelia* species. The appreciable germination obtained after second and even after third refrigeration indicates that freezing-point stratification may be used advantageously on many *Phacelia* species, and suggests again that the coats of many *Phacelia* seeds are more or less impermeable.

Under the conditions of the experiment, retrial (second) stratification at 0° C. caused many more samples to reach or exceed 70 per cent germination than retrial stratification at 2.2°. For example, in flat B retrial stratification at 2.2° after primary stratification at 5° caused only one sample to reach 70 per cent germination, whereas still another (third) stratification of the same flat, at 0°, caused seven additional samples to equal or exceed 70 per cent germination.

In conclusion, then, it appears that seeds of many annual species of *Phacelia* will grow immediately and without special treatments designed to obviate seed dormancy. Seeds of many perennial species are satisfactorily conditioned for germination by stratification treatment at 0° C. for 140 days. An alternation of stratification periods at low temperature with germination periods in the greenhouse is more generally productive of seedlings than a single stratification treatment followed by a germination period in the greenhouse.

Bureau of Entomology and Plant Quarantine,
Agricultural Research Administration,
United States Department of Agriculture,
Berkeley, California.

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THE GENUS MIMULUS IN OR ADJACENT TO SINALOA, MEXICO

Howard Scott Gentry

In the course of naming my Sinaloa collections of *Mimulus,* it was found that only two species, *M. pallens* and *M. verbenaceus,* have been published as occurring in the Mexican state of Sinaloa. These are represented by two collections cited by Grant in her monograph of the genus (Mo. Bot. Gard. Ann. 11: 99–388. 1924). This paucity of material in a large genus that is known to range widely north and south of Sinaloa can also be detected in many other montane genera, for little mountain collecting has yet been done in that area.

The following list records the species now known to occur in Sinaloa, as based upon recent collections. Also included are several species which have been found adjacent to Sinaloa and hence can be expected to be found there as explorations continue. A provisional key is offered for ready determination of species in the area and to orient two entities proposed as new species. Following the key the species are annotated in alphabetical order.

Key to Species of Mimulus

- Corolla red or orange-red, large, *ca.* 2 inches long (Sect. Erythranthe).
  - Calyx teeth unequal; style included in calyx .... 6. *M. Nelsoni*
  - Calyx teeth equal; style exserted .... 9. *M. verbenaceus*
- Corolla yellow, sometimes red-spotted, less than 1 inch long.
  - Calyx teeth equal, acute; style twice length of capsule (Sect. Paradanthus) .... 3. *M. floribundus*
  - Calyx teeth unequal, upper longer than others (Sect. Simiolus).
    - Calyx teeth three .... 7. *M. pallens*
    - Calyx teeth five.
      - Flowers terminal, racemose; corollas 15 mm. long or more .... 5. *M. guttatus*
      - Flowers axillary, usually solitary; corollas less than 15 mm. long.
        - Corolla lobes laciniate .... 2. *M. dentilobus*
        - Corolla lobes not laciniate.
          - Calyx lobes broadly rounded, sometimes mucronate; plants usually over 10 cm. high ...... 4. *M. glabratus*
          - Calyx lobes triangular-acute, mucronate; plants less than 10 cm. high.
            - Calyx 7–8 mm. long in fruit; style long exserted; basal leaf blades all less than 1.5 cm. long; petioles narrow .... 8. *M. Pennellii*
            - Calyx 9–10 mm. long in fruit; style included in fruiting calyx; some basal leaf blades 2 cm. long or more; petioles broadly winged, clasping the stem .... 1. *M. calciphilus*

1. **Mimulus calciphilus** sp. nov. Annuus, ad basim multoramosus, 7–14 cm. altus; foliis ad basim aggregatis, late ovatis,

obtusis, undulati-dentatis, glandulosi-pilosis, 2.5–3.5 cm. longis, 2–3 cm. latis; petiolis brevidus alatis; pedunculis 2–4 cm. longis; calyce angulati-urceolato, pubescenti, circo 1 cm. longo, dente supremo 3–4 mm. longibus, dentibus lateralibus 1 mm. longis, ventralibus 1.5–2 mm. longis; corolla 1 cm. longa, flava, lobis inequalibus, eis lateralibus dorsali quam brevioribus; antheris glabris, inclusis; stylo glabro, incluso; capsula ovati-subglobosa, subsessili.

Small mesophytic annual 7–15 cm. high with a basal rosette of large, broadly ovate leaves and wide-winged petioles; stems scapose, pubescent, shallowly sulcate, bearing 1–2 pairs of leaf-like bracts; leaves radical, 2.5–3.5 cm. long, 2–3 cm. wide, 5–7-nerved, villous on both surfaces, undulate-denticulate, obtuse, broadly decurrent making a winged petiole; pedicels 2–4 cm. long, axillary from radical leaves or from the denticulate leaf-like bracts on the scape, simple, glandular-villous; calyx accrescent, 8–11 mm. long, angulate-urceolate, sparsely glandular villous, red-tinged in maturity, the lobes triangular-acute; upper lobe 3–4 mm. long, lateral lobes 1 mm. long, ventral lobes 2 mm. long and often folding over lateral lobes; corolla about 1 cm. long, yellow, the limb short; lobes rounded, equal, 1 mm. long, 2 mm. broad; stamens glabrous, included in corolla; stigma broadly lanceolate-lobed, the lobes subequal; style glabrous, included in fruiting calyx; ovary glabrous, short-stipitate; capsule oblong, subsessile, 5 mm. long.

Type. Near Los Pucheros, at about 6500 feet elevation, Sierra Surotato, Sinaloa, Mexico, March 17–24, 1945, *Gentry 7217* (Univ. of Mich. Herbarium; isotypes to be distributed).

This species appears to have no close relative in North America. It belongs in the section Simiolus and in Grant's monograph (*op. cit.*, p. 145) keys to *M. Whipplei.* The radical leaves with broadly winged petioles and five to seven veins, the larger calyx, equally lobed corolla, and the included style and stigma are only some of the more important characters distinguishing it from *M. Whipplei* and other members of the genus. The flowers are persistent for a *Mimulus.* With its basal rosette of leaves and scapose stem flanked by rather sinuous pedicels holding the large semi-nodding calyces, *M. calciphilus* presents a singular appearance. The only observed occurrence of the species is the small compact colony in rich humus soil of the talus slope footing the calcareous crags (whence the specific name) known locally as Los Peñascos.

2. Mimulus dentilobus Rob. & Fern. Proc. Am. Acad. Sci. 30: 120. 1895.

Mimulus dentilobus is a small, delicate, finely cut plant, the small heads not reaching more than 3 to 4 inches in height. If the plants are observed closely, the laciniate corollas are visible to the naked eye and they serve at once to identify the species.

This is a rarely collected species known previously from southern New Mexico, southern Arizona, Sonora, and from above Puerto Escondido in the Sierra Giganta in the southern part of Baja California. Recently it has been collected in the Sierra Surotato, northern Sinaloa, in a cave near Los Pucheros at about 6500 feet elevation (*Gentry 7220*), growing in a tight mass on bare igneous rock kept moist by dripping water. Cattle had access to the cave and had stripped off the succulent moist carpet as high as they could reach.

3. **Mimulus floribundus** Dougl. in Lindl. Bot. Reg. pl. 1125. 1828.

A cespitose plant, the stems slender, pilose, often decumbent and rooting at the nodes, sometimes reaching 30 cm. in height but usually shorter. A rather slimy or wet-viscous herb. Corolla yellow with reddish spots in the open throat.

In western North America this species is known from British Columbia to Jalisco, Mexico (*Mexia 1853*). In Sinaloa, as indicated by the following collections, it appears to be common through the cerro and valley region of the Sierra Madre piedmont: Varomena, *Gentry 7147;* Puerto a Tamiapa, *Gentry 5866a;* Cerro Colorado, *Gentry 5469;* San Blas, *Rose, Standley & Russel 13395.*

4. **Mimulus glabratus** H.B.K. Nov. Gen. & Sp. 2: 370. 1895.

This species as interpreted by Grant (*op. cit.*) is a wide-ranging highly variable perennial herb. Grant cited it from several states in Mexico north, south, and east of Sinaloa. There are, however, no known collections from Sinaloa, but further explorations should reveal it there.

5. **Mimulus guttatus** DC. Cat. Hort. Monsp. 127. 1813.

There are no known collections of this species from Sinaloa, but since it has been found in adjacent Sonora (*Gentry 1305,* Carnegie Inst. Publ. no. 527: 237. 1942) and Chihuahua (*Gentry 2780, loc. cit.*), it doubtless occurs in northern Sinaloa.

6. **Mimulus Nelsoni** Grant, Ann. Mo. Bot. Gard. 11: 144. 1924.

This species is known only from the adjacent state of Durango, "30 miles north of Guanaceri [Guanaceví], Sierra Madre (*Nelson 4775*)." This locality is close to the Sinaloa-Durango boundary.

7. **Mimulus pallens** Greene, Leafl. Bot. Obs. & Crit. 2: 4. 1909.

This species is distinguished by the three-toothed calyx. The yellow flowers are spotted red in the open throat. It forms showy colonies 15 to 25 cm. high along streams. It appears to be restricted to a riparian habitat and is rather common through the higher elevations, only rarely dropping below the lower limit of oaks. It is a Sierra Madre species known previously from Sonora, Chihuahua, and Durango. The following Sinaloa collections have been made: Los Pucheros, Sierra Surotato, *Gentry 7213, 7232;* above La Jolla, Sierra Surotato, *Gentry 7285;* all of the collections were made in March when the plant was in full bloom.

8. **Mimulus Pennellii** sp. nov. Annuus vel perennis; caulibus procumbentibus, 6–12 mm. longis, sparsim villosis foliis late ovatis, dentatis acutis, petiolatis, supra villosis, infra glabris, 6–10 mm. longis, 8–12 mm. latis; pedunculis axillaribus, 1.5–3 cm. longis; calyce 6–8 mm. longo, puberulenti, dentibus triangularibus, acutis, inequalibus, dente supremo alteris plus quam duplo longiore; corolla 8–9 mm. longa, flava; staminibus glabris, inclusis; stylo glabro, laciniis aequalibus, exsertis, ligulatis; capsula ovata, attenuata, subsessili; seminibus levibus fuscis.

Small annual or perennial aquatic herbs 5–8 cm. high, cespitose, rooting at the nodes, the leaves petioled and calyces narrow. Stems procumbent, slender, sparsely pilose, glabrate, reddish, the internodes 1–3 cm. long; leaves petiolate, the petioles 2–6 mm. long, blades 6–10 mm. long, 8–12 mm. wide, broadly ovate to triangular-ovate, dentate, 5-nerved, minutely scabrous, glabrate or glabrous below and villous above; peduncles axillary, single, 1.5–3.0 cm. long, pubescent near the base; calyx weakly accrescent, 6–8 mm. long, narrowly funnelform or strictly campanulate, ascending-strigillose within, sparsely pubescent outside and rather lucid, the lobes triangular-acute, upper 2–3 mm. long, the others 1–2 mm. long, the ventral folding over weakly in maturity; corolla 8–9 mm. long, yellow with red-spotted throat, the lobes rounded, spreading; stamens included, glabrous; stigma lobes subequal, broadly lanceolate; style flat, minutely striate, glabrous, exserted beyond fruiting calyx; ovary glabrous, subsessile; capsule narrowly ovoid-terete, broadly lobate between the sutures, the margins of the lobes undulate; seeds light brown, ovoid-orbicular, somewhat depressed.

Type. Rancho Africa, elevation 2000 to 3000 feet, Sierra Tacuichamona, Sinaloa, Mexico, February 19, 1940, *Gentry 5691* (Univ. of Mich. Herbarium; isotypes in the following herbaria: Gray, Univ. Ariz., Univ. Calif., Stanford Univ., Mo. Bot. Gard., N. Y. Bot. Gard., Inst. Biol. Mex., Gentry).

This diminutive hydrophyte formed a loose mat on a large water-covered rock in tropical montane forest. In Grant's monograph it keys to *M. glabratus,* but is distinguished from that broad far-flung complex by the petiolate upper leaves and particularly by the rather narrowly triangular acute calyx lobes. It is named in honor of Francis W. Pennell, authority on the family.

9. Mimulus verbenaceus Greene, Leafl. Bot. Obs. & Crit. 2: 2. 1909.

The natural habitat of this species is montane in the origins of streamways, such as rocky seeps and waterfalls in canyons where permanent moisture is available. In such situations it is often found in low bushy clumps. Occasionally it occurs in a less cespitose form along the lower river courses, as near Fuerte, but the seasonal floods sweeping such rocky river beds alternately initiate and destroy lowland adventives of the species.

Known from the Grand Canyon, Arizona, to northern Sinaloa. Sinaloa, Mexico: above La Jolla, Sierra Surotato, *Gentry 7284;* sandy soil along the river near Fuerte, *Rose, Standley, & Russel 13074.* Grant (*op. cit.,* 144) cites Sierra de Alamos as in Sinaloa. This is an error since that mountain is in Sonora.

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LOCATION OF EXTRANEOUS MATERIALS IN REDWOOD

Irving H. Isenberg

This paper is one of a series originating from the laboratories of The Institute of Paper Chemistry, Appleton, Wisconsin, and covering a fundamental study of the botanical, chemical and other characteristics of the California redwood (*Sequoia sempervirens*); this work has been sponsored by The Pacific Lumber Company, Scotia, California.

In order to study the location of extraneous materials in redwood and the effect of certain treatments on these substances, microsections (20 µ thick) were made from the following locations in a redwood tree—namely, outer portion of heartwood, sapwood, junction of sapwood and heartwood, and rootwood. The major portion of the work was done on the heartwood sections. The treatments used on the various sections and the results obtained are, for the most part, described briefly in Table 1.

Heartwood

In the heartwood the extraneous material is located chiefly in the cell cavities of the wood ray parenchyma and the longitudinal parenchyma but may also be present in the walls of these cells as well as in the walls of the tracheids, the only other type of cell structure present in redwood (pl. 1, figs. 1, 2). This extraneous material includes mainly dead protoplasm, proteins, starch, tannins, phlobaphenes, and fats, and is dark red in color, especially in the longitudinal wood parenchyma cells.

The reaction of the cell contents to the various reagents, as

TABLE 1. EFFECT OF REAGENTS ON CELL CONTENTS

TREATMENT	APPEARANCE AND RESULTS
	Heartwood
None	Dark red (especially the longitudinal wood parenchyma).
Dilute ferric chloride	Cell contents bluish black.
Cold alcohol for 5 minutes	Considerable amount of cell contents dissolved.
Hot alcohol	Some cell contents still remain, located mainly in ray parenchyma.
Hot water for 3 hours (following hot alcohol)	Small amount of cell contents still retained.
Hot dilute alkali (1% NaOH) for 3 hours (following alcohol and water)	All extraneous material removed. Cell walls greenish, slightly swollen.
	Sapwood
Dilute ferric chloride	Only a small amount of cell contents affected in color, and then only slightly.
Cold alcohol	Considerable amount of material remains, yellow in color.
	Rootwood
None	Light to dark brown in color.
Dilute ferric chloride	Color darkened, but not uniformly.
Hot alcohol	Considerable amount of material of various shades of brown persists.
Acidulated alcohol (3% acetic acid) for 3 hours	Tannates converted to tannins; large amount of extraneous material retained.
Hot water for 3 hours (following acidulated alcohol)	Some extraneous material remains (pl. 2, fig. 3).
Hot dilute alkali (1% NaOH) for 2 hours (following alcohol and water)	All extraneous material removed; cell walls greenish yellow (pl. 2, fig. 4).

well as the analytical data reported elsewhere by Lewis [Chemical Nature of Redwood, The Vortex, 7(5): 218. May, 1946], indicate a considerable amount of tannin and phlobaphene in the heartwood. For comparison, these data are presented in Table 2.

If the cross-sections, which have been previously extracted with hot alcohol for three hours and hot water for three hours, are treated alternately with chlorine gas and a 3 per cent alcoholic solution of monoethanolamine in such a way as to dissolve the lignin without hydrolysis of the non-cellulosic carbohydrates the holocellulose is left. The visible effect (pl. 1, fig. 3) of the lignin solvent is a removal of the intercellular material so that the cells pull apart by themselves or at the touch of a dissecting needle. The summerwood ring seems particularly susceptible to handling. It is impossible to obtain other than very small sections of holocellulose unless the treated section is handled on a microslide throughout the operation. After the holocellulose is prepared, a piece is treated with 72 per cent sulfuric acid; if it dissolves (leaving only minute traces), it is considered that the lignin has been removed during the preparation of the holocellulose. When the holocellulose is treated with dilute sulfuric acid to remove the easily hydrolyzable carbohydrates and leave a material closely resembling Cross and Bevan cellulose, the structure does not appear to change.

TABLE 2. AMOUNT OF TANNIN AND PHLOBAPHENE IN REDWOOD
(Based on oven-dry wood)

	Per cent of tannin	Per cent of phlobaphene
Heartwood	4.1	6.2
Sapwood	0.2	0.7
Rootwood	7.8	22.1

When extractive-free cross sections are treated with 72 per cent sulfuric acid to remove the carbohydrates and leave the framework of lignin, the cell walls immediately turn green and begin to swell. Since the walls of the summerwood cells are much thicker than those of the springwood cells, the swelling is greater and the summerwood is distorted considerably. This swelling causes a loss of identity in some of the summerwood cells, especially if the acid is removed and the section is washed and dehydrated preparatory to making a permanent slide mount. After a brief period of exposure to the concentrated acid the structure turns brown but continued contact apparently causes no further action (pl. 1, fig. 4).

SAPWOOD

Although considerable extraneous material is present in the cell cavities of parenchymatous cells in the sapwood, they do not appear to contain much tannin. This observation is in agreement with the low tannin content of the sapwood as determined analytically.

ROOTWOOD

The rootwood contains large amounts of extraneous materials and many of the tracheids are filled, in addition to the ray parenchyma and longitudinal parenchyma cells (pl. 2, figs. 1, 2). This extraneous material is light brown to dark brown in color.

USES AND SUMMARY

Redwood makes an interesting plastic pulp because of the tannin and phlobaphene present. These substances flow under high pressures and serve as binders. Unfortunately, in rootwood the fibers are not suitable and the resin content is too high for this

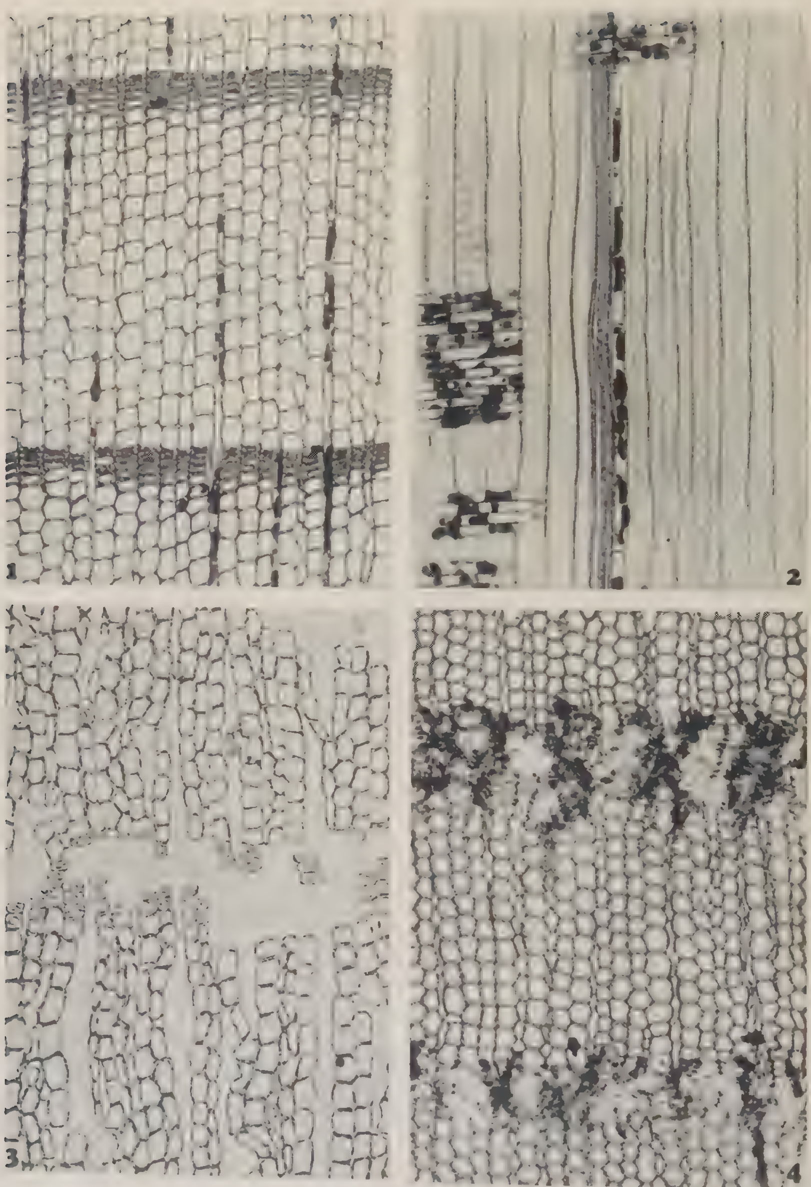

Plate 1. Heartwood of Sequoia sempervirens. Fig. 1. Transverse section. Fig. 2. Radial section. Fig. 3. Transverse section showing holocellulose. Fig. 4. Transverse section after treatment with 72 per cent sulfuric acid. (All ×50.)

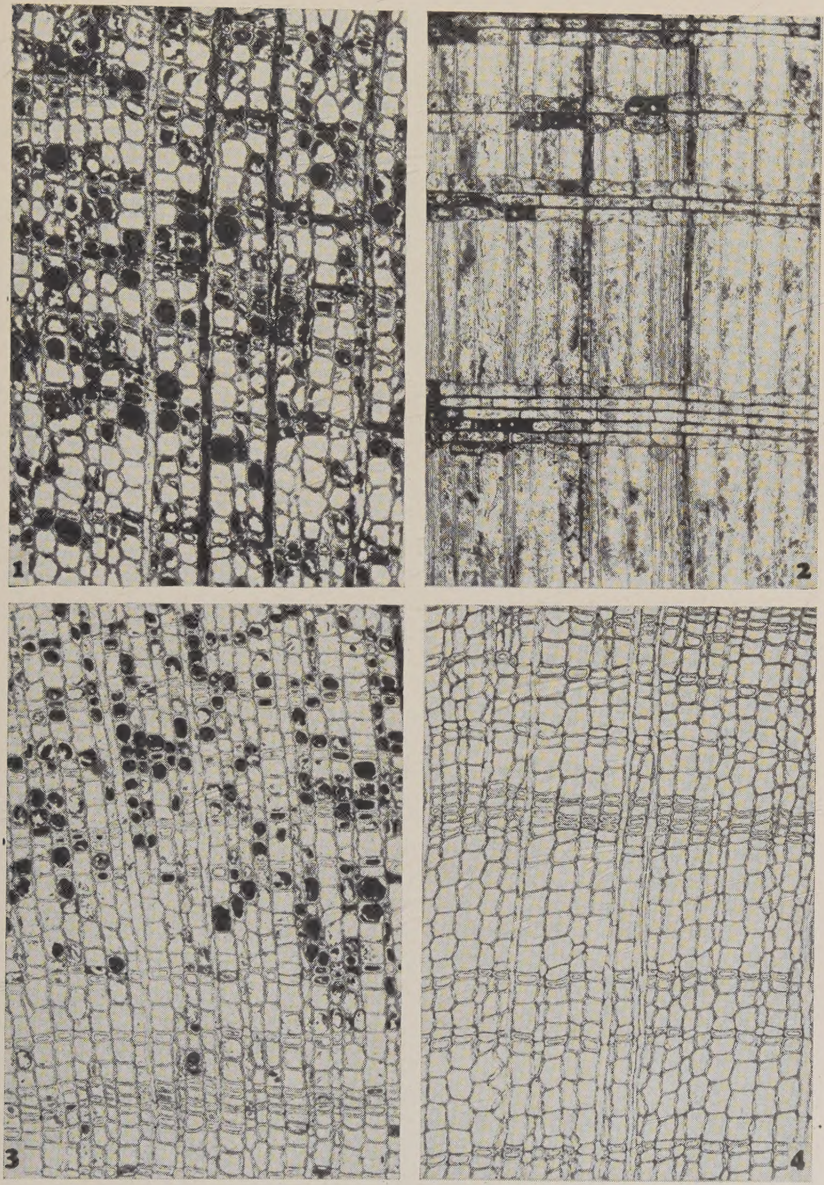

Plate 2. Rootwood of Sequoia sempervirens. Fig. 1. Transverse section. Fig. 2. Radial section. Fig. 3. Transverse section after 3 hours extraction with hot acidulated alcohol (3 per cent acetic acid) and 3 hours extraction with hot water. Fig. 4. Transverse section extracted for 2 hours with 1 per cent sodium hydroxide in addition to treatment with hot acidulated alcohol and hot water. (All ×50.)

purpose. However, it is of interest as a source of extractive materials.

Tannin from redwood is a good tanning agent and anti-oxidant; the phlobaphene is a source of catechol on vacuum destructive distillation. Roots and stumps on destructive distillation yield a tar richer in phenol, creosol, guiacol, and *p*-cresol than that obtained from sapwood and heartwood. Although the tannin is not highly toxic it does help, with related materials, to make the heartwood rot resistant.

It appears from this study that most of the tanniferous material present in redwood is located in ray parenchyma and longitudinal parenchyma cells. The cell walls must contain some also, because it is unlikely that solutions would not diffuse into the walls.

The Institute of Paper Chemistry,
Appleton, Wisconsin.

REVIEW

The Pacific Coast Ranges. Edited by RODERICK PEATTIE. Contributors Archie Binns, John Walton Caughey, Lois Crisler, Aubrey Drury, Idwal Jones, Donald Culross Peattie, Thomas Emerson Ripley, Richard Joel Russell, Judy Van der Veer, and Daniel C. Willard. 402 pp. 4 maps. 29 illustrations. $3.75. The Vanguard Press, New York. 1946.

This volume is the fourth in a popular series of books written about the American mountains. The three previous volumes have been published under the titles *The Rocky Mountains, The Great Smokies and the Blue Ridge,* and *The Friendly Mountains* (Green, White, and Adirondacks). In this volume, *The Pacific Coast Ranges,* a capable editor and equally capable contributors have presented in non-technical language and in a narrative form an exceptional amount of general scientific and historical information. The scope and varied nature of the subject matter make a detailed review difficult and impractical. However, an outline of the thirteen chapters or narratives will give an idea of the extensive subject matter treated.

The California missions and the first peoples of the Coast Ranges furnish the subject material for the first two chapters, "Father Serra's Rosary," by Donald Culross Peattie and "The First Inhabitants of the Coast Ranges," by John Walton Caughey. The two authors give slightly different interpretations of the fate of the Indians upon secularization of the missions. In the first chapter, page eleven, we read:

> The missions were secularized, that is reduced to parish churches with a single priest, and stripped of everything except the immediate buildings themselves. First, many of the pioneering padres who had been men of education and high ideals, were supplanted by inferior friars,

> . . . . Then the lands, which the fathers held in trust for the Indians and brought to high productivity, were taken over and given in immense feudal tracts to settlers from Mexico, the rancheros and ranchmen. *The Indians who had given up their native life for the white man's way, were stripped of both at once,* and so driven to beggary or to acts of violence for which they could be punished.

In the second chapter, page forty-two, we read:

> The missions, therefore, were secularized. As religious institutions they were transformed into parish churches. The Indians were released from the friars' paternal care and were put on their own. From the property that had been accumulated and held in trust for the Indians, *each released neophyte was allotted a reasonable amount.* Secular administrators controlled the oftentimes considerable residue, and the surplus lands reverted to the state, which was ready to parcel it out generously to prospective rancheros.

In the second account, written by Dr. John Caughey, the historian, it appears that the Indians were given slightly more consideration at the time the missions were secularized.

The third narrative, "Footsteps of Spring—a Wild Flower Trail," by Donald Culross Peattie, gives an account of the native vegetation of the Coast Ranges as it comes into flower, beginning in the south and continuing to the north. The botanical information here included and style of presentation could only be written by one versed in botany and possessed of the gift of writing, as is the good fortune of Mr. Peattie.

In chapter four, "Glimpses of Wild Life," Aubrey Drury gives brief but interesting accounts of the distribution and habits of bears, various deer, cats, coyotes and other mammals, birds, and fish of the stream and sea.

Judy Van der Veer in chapter five presents in an entertaining manner some aspects of the human, animal, and plant life of the foothills of the Coast Ranges of California as observed in summer, fall, winter, and spring.

Further insight is given into some of the variety of wild life and people living in the Coast Ranges of California in the next chapter, "Farm, Rock, and Vine Folk," by Idwal Jones.

John Caughey in chapter seven, "Headlands in California Writing," writes of the earliest manifestations of literary talent in California, namely that of the primitive Indians. This is followed by a brief account of Spanish annals, writings of early explorers and travellers, writings stimulated by the gold rush period, writers of the second generation, and the moderns. Caughey's excellent knowledge of California history adds greatly to this narrative on California writing.

One of the lesser explored areas of the Pacific Coast Ranges, the Olympics, furnishes the subject material of chapter eight. This narrative, entitled "The Wilderness Mountains," was written by Lois Crisler, former instructor of English at the University of Washington and now an inhabitant of the Olympic area. Mrs.

Crisler gives the reader many illuminating glimpses of the pioneers, the history, the mountains, and the life of the "dark realm of the Olympics."

Since lumber is one of the main products of the forested regions of the Pacific Coast Ranges, particularly in the Northwest, the chapter on timber by Thomas Emerson Ripley comes as no surprise. The surprise comes, however, in the amount of interesting and instructive material—from the explorations of David Douglas to modern logging and conservation—that is included in the twenty-three pages of narrative comprising chapter nine.

Chapters ten and eleven, "People of the Oregon Coast Range" and "People of the Washington Coast Range" respectively, were written by Archie Binns, the well-known writer of novels having their background in the great Northwest. These two chapters contain many human interest stories associated with the early frontier, the hills, the coast line, lonely valleys, mountains, rivers, and inlets. These stories are so well integrated with the history of the region that one feels that he has been reading the history of the Oregon and Washington Coast Ranges written by one not only gifted as a writer but as an historian.

In most strictly scientific treatments of geographical areas the geology and climatic conditions are usually given in the introduction or in the eary sections. The editor of *Pacific Coast Ranges* has placed these subjects in the last two chapters. This seems to the reviewer to be good practice, because, as the editor states, "But until the lay reader has learned some place geography, some variety of landscape, he or she is not ready to understand geology (and climatology)." "The Geological Story," the title of chapter twelve, was written by Professor Daniel E. Willard in a popular yet a scientific vein, a style of writing of which so few scientists are capable.

The last chapter, "Climatic Transitions and Contrasts," by Professor Richard Joel Russell, contains the statistical data and other more interesting facts about the climate and its effects upon the Pacific Coast Ranges from Puget Sound to the Gulf of Mexico.

After reading the thirteen chapters, full of information, about the first inhabitants of the Coast Ranges, the California missions, the wild flowers, shrubs, trees, animals, the foothills, the wilderness areas, the people of the Oregon and Washington Coast Ranges, the geological story, and the climatic transitions and contrasts, one is inclined to agree with the editor when he says that he does not have the answer to the question, "Why do people live in the East?."

The twenty-nine excellent photographs of varied and well-selected subjects and the four maps add greatly to the enjoyment and value of the book.—H. E. McMinn, Mills College, California.